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# NEWS LETTER

VOLUME IV

# 6

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UNITED STATES DEPARTMENT OF AGRICULTURE

BUREAU OF ENTOMOLOGY AND PLANT QUARANTINE

# NEWS LETTER

# FOR APRIL 1937

Vol. IV, No. 6 (Not for publication) June 1, 1937

## ADMINISTRATION

Enforced pest control in Germany.--With the view to expanding the national agricultural output to maximum levels, new legislation was enacted in Germany on March 5, empowering the Minister of Foodstuffs to enforce the use of insecticides and to institute other crop-protective measures for combating plant pests and diseases, says a report from Consul Sydney B. Redecker, Frankfort-on-Main, to the Commerce Department. The new legislation is designed to reduce the heavy agricultural losses from pests and diseases, estimated at from 60 to 80 million dollars per annum, thus lessening the nation's dependency on foreign countries for foodstuffs, the report states. Under provisions of the decree the Reich Minister of Foodstuffs is endowed with far-reaching powers, such as requiring farmers to allow officials to inspect their lands and stocks where infection is suspected; the destruction of infected crops and agricultural products, as well as the disinfection of soil, warehouses, and equipment; and the institution of other measures designed to reduce pests and diseases, including the rotation of crops.

## FRUIT INSECT INVESTIGATIONS

Effect of paradichlorobenzene on Japanese beetle larvae.--W. E. Fleming, of the Moorestown, N. J., laboratory, has recently completed a series of experiments on the horizontal penetration of paradichlorobenzene vapor into moist sassafras sandy loam at temperatures ranging from 45° to 70° F. In these experiments, which were begun in November 1936, 14,600 larvae have been used to determine the penetration into masses of soil 2 inches thick, 24,800 larvae in masses 4 inches thick, 28,800 in masses 6 inches thick, 33,600 in masses 8 inches thick, and 42,000 in masses 10 inches thick. The larvae were confined in the soil in such a manner that each cubic inch of soil contained one. This procedure eliminates the error which is introduced when larvae migrate from the most remote point to the areas nearer the source of the gas. It has been found that a concentration of 20 pounds of crystals per cubic yard of plunging soil is no more effective than 10 pounds. Decreasing the concentration to 5 pounds tends to increase the exposure over that required in the 10-pound treatment 1 day in the 2-inch masses, and for longer periods in larger masses of soil. The 1-pound treatment was found to be largely ineffective.

*Japanese beetle larvae as food of sea gulls*.--In recent years it has been noted that great numbers of sea gulls (*Larus argentatus*) come into the sections of southern New Jersey adjacent to Delaware Bay in the spring to feed on larvae of the Japanese beetle turned up when cultivated fields are plowed for spring planting. F. A. Raymaley, county agricultural agent for Cumberland County, N. J., has recently forwarded a report on examinations made by the Bureau of Biological Survey of the stomachs of two gulls caught by him. Both stomachs contained practically 100 percent of animal matter, with a trace of vegetable matter. One contained approximately 10 percent of gravel (mud and dirt) and the other 5 percent of gravel. The contents of the two specimens as listed were found to be as follows: (1) 260+larvae of *Popillia japonica*, 95 percent; 7 larvae of *Monocrepidius* sp., 1 percent; 15 larvae of *Melanotus* sp., 2 percent; 12 larvae of Carabidae, 1 percent; 1 Carabidae, tr.; skin of a fruit, possibly *Solanum carolinense*; mud and dirt. (2) *Popillia japonica*, 555+larvae and 1 adult, 95 percent; 8 Annelida, 5 percent; other Coleoptera--1 *Scarites subterraneus*, 1 *Poecilus lucublandus*, 2 *Leiocnemis avida*, each a trace; 1 *Asilus* (?) sp. larva, 1 Anatidae (duck) feather, each a trace; 2 small pieces wood, trace; 2 Bombyliidae larvae, trace.

*Survey of infestation in stored raisins*.--A report by H. C. Donohoe of the Fresno, Calif., laboratory, on examinations of 106 samples of raisins, shows the condition of the fruit at the end of winter. The sampling was done between February 16 and March 9 at six commercial storage plants and included raisins of the 1935 and 1936 crops. In addition to the pests recorded below, adults of *Microbracon hebetor* Say, an abundance of book lice, and a few mites were found.

| Insect | Infestation per ton-- | | | | |
|---|---|---|---|---|---|
| | 1935 | | 1936 | | |
| | Thompson seedless | Sultana | Thompson seedless | Sultana | Muscat |
| *Ephestia figulilella* Greg. (larvae) | 562 | 583 | 4,124 | 4,589 | 5,523 |
| *Plodia interpunctella* Hbn. (larvae) | 269 | 638 | 226 | 233 | 0 |
| *Vitula serratilineella* Rag. (larvae) | 0 | 50 | 0 | 0 | 0 |
| *Ephestiodes nigrella* Hulst (larvae) | 0 | 0 | 35 | 217 | 0 |
| *Cryptophagus insoitus* Csy. [1] (larvae, pupae, adults) | 3,463 | 276 | 553 | 529 | 2,289 |
| *Oryzaephilus surinamensis* L. (adults) | 29,388 | 49,333 | 2,137 | 5,668 | 1,310 |
| *Enicmus protensicollis* Mannh.[1] (adults) | 209 | 0 | 34 | 0 | 0 |
| *Cryptolestes ferrugineus* Steph. [1](adults) | 995 | 104 | 0 | 0 | 0 |
| *Tribolium confusum* Duv. (adults) | 174 | 0 | 0 | 0 | 0 |
| Dermestids (larvae and adults) | 1,098 | 1,763 | 0 | 0 | 0 |
| % All species | 36,158 | 52,747 | 7,109 | 11,236 | 9,122 |

[1] Identifications tentative.

## MEXICAN FRUIT FLY CONTROL

Conditions in the lower Rio Grande Valley.--During the latter half of April flies began to emerge from known infested properties and by the end of the month traps had taken a total of 1,491 adult Anastrepha ludens Loew.

The usual tree-to-tree inspection was approximately 50 percent completed by the first of May. Scattering fruit collected on 209 properties during these inspections was found to be infested. All of these properties have been cleaned of fruit susceptible to infestation and no known larval infestation remains within the area. The following table shows the results of trapping and field-inspection work throughout the month. All of the adults and larvae were taken on the Texas side of the Rio Grande.

| Species | Adults trapped | Larvae collected |
|---|---|---|
| | Number | Number |
| Anastrepha ludens | 1,491 | 2,132 |
| Premises | 191 | 209 |
| Anastrepha acidusa | 1 | -- |
| Premises | 1 | -- |
| Anastrepha sp. "Y" | 12 | -- |
| Premises | 11 | -- |
| Anastrepha pallens | 919 | -- |
| Premises | 200 | -- |
| Toxotrypana curvicauda | 6 | -- |
| Premises | 6 | -- |

## CEREAL AND FORAGE INSECT INVESTIGATIONS

Varietal resistance of sweet corn to European corn borer.--M. Schlosberg and R. Mathes, of the Toledo, Ohio, laboratory, report that out of a total of 175 strains of sweet corn tested in 1936 for resistance to the European corn borer, 9 inbred and 14 hybrid strains were determined to possess sufficient indication of corn borer resistance, on the basis of the difference between their expected and observed populations, to continue them in further tests. The strains selected for additional study of resistant plant characters are as follows:

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| Source | Pedigree | Kind |
|---|---|---|
| Inbred lines | | |
| Minnesota | 26-34 | Bantam |
| Do | 13-34 | Do. |
| Iowa | 45 | Do. |
| Do | 9 | Do. |
| Connecticut | C7 | Do. |
| Michigan | 351828 | Do. |
| Ohio | sG206-2-1-5 | Do. |
| Iowa | 1434 | Country Gent. |
| U. S. D. A.--Purdue | 1009-2 | Evergreen |
| Hybrid single crosses | | |
| Minnesota | 38-28 X Gold. Bant. | Bantam |
| Do | 6-34 X Gold. Bant. | Do. |
| Do | 26-34 X Gold. Bant. | Do. |
| Iowa | Gold. Sun. X 45 | Do. |
| Do | 51 X 30 | Do. |
| Michigan | 351807 X 351085 | Do. |
| Iowa | 900 X 1445 | Country Gent. |
| Do | 1389 X 1434 | Do. |
| Do | 12E X 1248 | Evergreen |
| Do | 12E X 191 | Do. |
| Do | 1363 X 191 | Do. |
| Illinois | 13 X 11 | Do. |
| Do | 11 X 14 | Do. |
| Maryland | Ev. X H146-1-1-1 | Do. |

Relative numbers and growth of borers in resistant and susceptible field corn, with stage of plant development.--According to L. H. Patch and G. T. Bottger, Toledo, in their 1936 experiments both numbers of borers and per-borer weights of larvae surviving on the resistant single-cross field-corn strain R4 X Hy were lower than those on the susceptible strain A X Tr. Also, immature corn offered more adverse conditions for borer survival, and the growth of the borers that did survive on immature corn was inhibited. On the basis of plant maturity, three nearly equal classes were made. In the first class, comprised of plots with plants from 60 to 147 cm tall, planted on the mean date May 26 and infested on the mean date July 7, only 37.7 percent as many borers were dissected from resistant R4 X Hy as from susceptible A X Tr. In the second class, made up of plots with plants from 150 to 185 cm tall, planted on the mean date May 21 and infested on the mean date July 16, only 45.2 percent as many borers were dissected from R4 X Hy as from A X Tr. In the third class, comprised of plots with plants from 186 to 213 cm tall, planted on the mean date May 14 and infested on the mean date July 21, only 71 percent as many borers were dissected from R4 X Hy as from A X Tr. It was estimated that borers 30 days old dissected from the immature plants of A X Tr had attained 23 percent of their mature weight, as compared with 33 and 67 percent, respectively, from the average and most mature corn of the same strain. As an average of all the corn, the borers in A X Tr had attained 41 percent of their ultimate weight at 30 days old, and the borers in the resistant strain R4 X Hy weighed 75.6 percent as much as those in the susceptible A X Tr.

*Importation of European corn borer parasites*.--C. A. Clark and E. D. Burgess, of the Moorestown, N. J., laboratory, report that 85,280 corn borer larvae were imported from Italy last fall and winter to supply principally adults of the parasite *Chelonus annulipes* Wesm. for liberation this summer. It is estimated that 7.8 percent of the larvae are parasitized by *C. annulipes*, 1.1 percent by *Inareolata punctoria* Roman and 6.4 percent by *Lydella stabulans* var. *grisescens* R. D.

*Hessian fly survival in Kansas and Missouri*.--E. T. Jones, of the Manhattan, Kans., laboratory, reports that limited surveys of fall hessian fly infestation in selected wheat fields in southeastern and central Kansas and southwestern Missouri indicate a comparatively light infestation over that area. Should weather conditions favor fly activity the pest may build up considerable infestation in some localities this spring. Results of puparia dissections from the moderate-to-strong fall infestations in our hessian fly-resistance test plots show a generally high winter survival, except at Junction City where nematodes injured or destroyed many larvae.

| Locality | Date of dissection | Larvae | | | Pupae | Total survival |
|---|---|---|---|---|---|---|
| | | Healthy | Unhealthy or dead | Parasitized | | |
| | | Percent | Percent | Percent | Percent | Percent |
| Springfield, Mo------- | April 1 | 58 | 12 | 0 | 30 | 88 |
| Manhattan, Kans------- | April 2 | 80 | 2 | 0 | 18 | 98 |
| Junction City, Kans-- | April 7 | 46 | 20 | 0 | 34 | 80 |

*Dispersion of hessian flies from field reservoirs*.--Mr. Jones also reports that in a study of hessian fly infestation reservoirs some interesting figures were obtained on the dispersal of fall-brood flies. Last summer the 1936 crop stubble in the bottom of a swale near Junction City was found to contain a 70-percent plant infestation, whereas in the rest of the field the infestation was less than 5 percent. On April 6 four areas at varying distances from the west edge of the swale were sampled and examined for infestation with the following results:

| Distance from swale | Plants infested | Range of plants infested |
|---|---|---|
| Feet | Percent | Percent |
| 5 to 10---------- | 44.0 | 40-48 |
| 25 to 30---------- | 17.0 | 11-23 |
| 45 to 50---------- | 7.7 | 6-9 |
| 95 to 100--------- | 3.3 | 3-4 |

The data obtained tends to support the theory that most general infestations of hessian fly develop from a few flaxseeds sparsely scattered in fields, rather than from fly reservoirs; however, pockets of infestation may play an important part in local outbreaks.

Upward migration of grubs in southern Wisconsin.--T. R. Chamberlin, L. Seaton, John A Callenbach, and C. L. Fluke, of Madison, Wis., report that no upward movement of the grubs was indicated by diggings in the sample pastures at Lamont and Gays Mills late in April. By May 6 most of the grubs were already in the upper 10 inches of soil at both Gays Mills and Lamont. Plowing and digging in stubble fields and sod east of Leeds, near the southern edge of Columbia County, showed that most of the grubs were in the upper 6 inches by the end of the month. Most of the larvae found in this section were Phyllophaga rugosa Melsh.

## JAPANESE BEETLE CONTROL

Control work started at isolated beetle infestations.--Application of lead arsenate to infestations in Detroit, Mich., was resumed on April 6. During 1936 lead arsenate was applied to 36.2 acres between April 30 and June 3, and 48.2 acres were treated from October 6 to November 6. Treatments now in progress will be extended to cover an additional 50 to 60 acres. Control work in Detroit is being performed as a local W. P. A. project. A representative of this Division is working with the treating crews but acts in an advisory capacity only. In Marietta, Ohio, where 121 beetles were trapped last summer, 16.7 acres were sprayed with lead arsenate between April 15 and 24. Assurances, received from the Ohio officials prior to issuance of the March 1, 1937, revision of the Japanese beetle quarantine regulations, that soil treatments would be made in Marietta early this spring, permitted exclusion of Marietta from the extension of regulated territory in Ohio. Treating operations in Indianapolis, Ind., got under way on April 22, and similar work began in Erie, Pa., on April 29. Resumption of soil treatments in Chicago, Ill., is scheduled for May 3. Treatments started in Chicago on August 24, 1936, had covered 93.5 acres before they were discontinued because of freezing weather on November 16. Approximately 50 acres still remains to be treated in Chicago in order to cover the sections in which 3,740 beetles were trapped last summer.

Traps being set in Southern States.--Japanese beetle trapping got under way for the 1937 season when a trap supervisor from the Bloomfield, N. J., field headquarters drove to Miami, Fla., late in April to make arrangements for setting the 300 traps to be operated in that city this season. These traps were set between April 21 and 26. The supervisor then proceeded to Tampa, where distribution of an additional 800 traps started on April 23. Local men are employed in each community to tend the traps. The trap supervisor will work north, supervising the establishment of trap routes in Orlando and Pensacola, Fla., and additional points in Alabama and Louisiana. When all routes are established, this supervisor will continue to operate in this territory until the trapping program in the South is concluded after traps have been in operation in each community for a 30- or

40-day period. Another trap supervisor will later start the trapping work in Jacksonville, Fla., Georgia, and part of South Carolina. Most of South Carolina, all of North Carolina, and southern Virginia will be under a third supervisor.

Trap manufacture.--By the addition of some unique devices, a number of machines have been adapted to large-scale production of the light-weight scouting trap, 100,000 of which are in process of manufacture at the Bloomfield headquarters. The metal stampings are cut from coated black plate by a 20-ton punch press. By the adaptation of a lock-seamer machine to the trap requirements, funnels are locked and seamed in a single operation, whereas previously these operations were performed separately. An automatic wire former, developed and built by divisional employees, is turning out 60 "S" hooks per minute. Another machine is now being constructed to automatically press the flat baffle stampings into right-angled baffle halves. An endless belt leading from the punch press will feed the flat baffle stamping into a slot of the forming machine. Weight of the baffle will complete an electric circuit and a cross arm will bend the baffle at right angles. Completed pieces fall out and are stacked as they are counted and placed in shipping containers. Construction of the season's supply of scouting traps will probably be completed by June 15.

Work in new extensions.--Extension of the Japanese beetle regulated area to include the city of Buffalo and immediately adjacent sections has added 21 classified nurseries and greenhouses to the northern New York area. In the Ohio regulated zone 36 nurseries and greenhouses have applied for and received classification. Since scouting of nurseries and greenhouses during 1936 in the vicinity of the Ohio infestations gave negative results, all establishments in the newly regulated area of that State are entitled to class I status, provided they conform to the regulations in other respects. One of the experienced inspectors from the Philadelphia district has been transferred to the recently enlarged West Virginia area. Desk space for this inspector has been provided in the county agent's office in the courthouse building at Clarksburg. During the month nursery and greenhouse establishments were canvassed in the two magisterial districts in Chesterfield and Princess Anne Counties, Va., that were added to the regulated area on March 1 last.

Chemical treatments in New York City area.--Nurserymen and sand shippers in the New York City district are gradually availing themselves of the various chemical treating procedures by which products that have been subject to Japanese beetle infestation may be freed of larvae and made eligible for certification. Shippers in this area are in more or less of a transitional stage between the preferred status to which they were entitled while they were free from infestation and the imposition of the more rigid supervision necessary following the finding of infestations on their premises. Six soil fumigations and treatments were made in this district during the month. Included in the treatments were 5 tons of molding sand destined to the Panama Canal, and 1,270 pounds of soil to be used at various western agricultural experiment stations, in connection with research on potato scab. Poor penetration of carbon disulphide in a soil block containing azaleas resulted in discontinuance of a seventh treatment.

Improvement in scouting trap.--Baffles of the light-weight scouting trap have been modified so that a perforated can with a solid top may be set in the center of the baffle assembly. The porcelain block-bait vaporizer will be enclosed in this perforated can so that the block will not be subject to loss of bait with each rain. This can may be removed from the trap without disassembling. This modification to provide for the bait-block container required an enlargement of the baffle die. The perforated can is small enough to fit into the beetle receptacle of the trap so that it does not affect the nesting of the trap assembly and quantity shipment of the traps in small boxes. Each porcelain bait block is now provided with a hole for part of its length. By using an ordinary oil can, liquid bait may be poured into this hole and the bait quickly renewed while the trap is in operation.

St. Louis control project resumed.--Arrangements were made late in April for resumption of the W. P. A. trapping-treating program in St. Louis, Mo. As soon as preliminary arrangements have been made a small crew will start setting traps in areas known to be infested. The traps will not be baited until early in June, when beetle emergence may be expected.

Larvae in root cavity.--Another instance emphasizing the importance of inspecting soil-free nursery stock for Japanese beetle larvae was disclosed by the removal of a larva from a small Japanese iris root inspected at Glassboro, N. J., prior to shipment from the regulated area.

Gypsy moth certification refused on stock from infested nurseries.--During the month (April) it was necessary to refuse gypsy moth certification on stock dug in a number of New England nursery units. Federal gypsy moth inspection and certification are conditioned on presentation of a valid State certificate stating that the nursery has been inspected by a State inspector and certifying that it is apparently free from moth infestation. The regulations also provide that whenever an appreciable infestation of the moth is determined by a Federal inspector on his examination of material offered for shipment, further certification for interstate movement from such nursery or independent unit thereof will be refused until such nursery has been freed from infestation and has been again inspected and certified by the State to be apparently clean.

Dutch elm disease eradication activities.--With the addition of 44 confirmations during the month, the number of Dutch elm disease cases to date increased to 21,932. During April sanitation crews removed 11,886 dead and dying elms. Crews working in areas to be made elm free destroyed an additional 167,159 trees. Chemical-treating crews also working in clear-cutting areas treated with copper sulphate bands a total of 41,127 elms. The W. P. A. personnel in New Jersey was increased by the addition of 940 laborers. W. P. A. men in the field at the end of the month numbered approximately 3,000. Total trees removed to date in clear cutting, eradication, and sanitation activities passed the 3,000,000 mark in April.

W. P. A. personnel losses continue.--Continued losses of W. P. A. laborers of the better type and their replacement with inexperienced help has affected the efficiency of the eradication work in some sections. Many of the men in the Connecticut and New York areas are leaving this project to accept private employment. Many men left following their reduction from the rate of skilled laborer to that of intermediate laborer. Considerable difficulty is being experienced in obtaining sufficient replacements in Connecticut to maintain the scheduled quota of workers. In the latter State 69 of the 290 laborers terminated their services between April 1 and 15. A number of nonrelief laborers were released on April 15 to reduce to 5 percent the proportion of nonrelief workers on the payrolls.

## FOREST INSECT INVESTIGATIONS

Food-plant preference of European spruce sawfly.--H. J. MacAloney, of the New Haven, Conn., laboratory, reports: "The laboratory work on the European spruce sawfly, carried on throughout the winter in a controlled room, was concluded at the end of April. However, the cages containing females and larvae will be continued in an office room in order to keep the generations active. As stated in an earlier report, it is evident that white, Colorado blue, and Koster's blue spruces are more favorable for oviposition than the Norway, red, and black spruces. There was a heavy mortality in the first two larval instars, often as high as 75 percent, on all hosts, but after the second instar the larvae developed more rapidly on vigorous twigs of white spruce and blue spruce. Adults issued from cocoons placed in vials, where there was a minimum of moisture, earlier than from cocoons placed in bottles with moist peat."

Parasitization of forest tent caterpillar.--P. B. Dowden and P. A. Berry, New Haven, report that 236 egg clusters of Malacosoma disstria Hbn., collected from various points in New England last fall, were held under controlled temperature and humidity conditions during March and April for information regarding hatch and parasitization. The results are shown in the following table. The figures on percentage of hatch were obtained by counting all the eggs in five clusters from each lot and by using the average number of eggs per cluster to compute the total for the separate lots. Percentages are based on total emergence of larvae and parasites.

| Liberation point | Egg masses | Eggs hatched | Hatch | Parasitization | Parasites |  |  |  |
|---|---|---|---|---|---|---|---|---|
|  |  |  |  |  | *Ooencyrtus clisiocampae* | *Telenomus clisiocampae* | *Tetrastichus* sp. | *Ablerus clisiocampae* |
|  | Number | Number | Percent | Percent | Number | Number | Number | Number |
| *Vermont:* |  |  |  |  |  |  |  |  |
| Bennington-- | 25 | 2,901 | 80 | 6.0 | 88 | 26 | -- | 74 |
| Bridport---- | 25 | 2,134 | 62 | 7.1 | 129 | 11 | 13 | 22 |
| Bristol----- | 25 | 2,025 | 66 | 8.7 | 170 | 17 | 4 | 3 |
| Danby------- | 25 | 1,598 | 71 | 14.1 | 237 | 3 | 4 | 17 |
| Pawlet------ | 25 | 2,001 | 82 | 12.7 | 247 | 15 | 2 | 29 |
| Randolph---- | 25 | 2,100 | 81 | 9.0 | 155 | 15 | 35 | 3 |
| Richmond---- | 10 | 579 | 55 | 9.6 | 58 | -- | 2 | 2 |
| Rutland----- | 25 | 1,698 | 68 | 9.9 | 139 | 46 | 3 | - |
| Springfield- | 25 | 2,145 | 62 | 11.0 | 85 | 13 | 1 | 168 |
| *Massachusetts:* |  |  |  |  |  |  |  |  |
| Williamstown | 26 | 1,909 | 73 | 10.0 | 119 | 20 | -- | 73 |

*Mortality of hag moth.*--Messrs. Dowden and Berry also report on parasitization and mortality of cocoons of *Cnidocampa flavescens* Walk., as follows: "Collections of overwintering cocoons of the oriental hag moth (*C. flavescens*) were made at observation points in Massachusetts in the vicinity of Boston. The cocoons were all dissected. Records on mortality and parasitization are shown in the following table.

| Locality | Moth larvae |  | Larvae of *Chaetexorista javana* |  | Parasitization |
|---|---|---|---|---|---|
|  | Living | Dead | Living | Dead |  |
|  | Number | Number | Number | Number | Percent |
| Dorchester (Columbia Road)---------- | 35 | 4 | 6 | -- | 17.0 |
| Dorchester (Boston St.)------------ | 172 | 2 | 13 | 5 | 7.0 |
| Cambridge-------------------------- | 112 | - | 1 | -- | 0.8 |
| Everett---------------------------- | 57 | 4 | 14 | -- | 24.0 |
| Beachmont-------------------------- | 163 | 2 | 20 | -- | 12.0 |
| Winthrop--------------------------- | 160 | 4 | 18 | -- | 11.0 |
| Revere Beach (Florence St.)-------- | 125 | 8 | 38 | -- | 30.0 |
| Chelsea---------------------------- | 140 | -- | 29 | -- | 20.0 |
| Nahant----------------------------- | 8 | -- | 1 | -- | 12.0 |
| Medford---------------------------- | 144 | 8 | 13 | -- | 9.0 |
| Swampscott------------------------- | 3 | -- | 3 | -- | 100.0 |
| Revere----------------------------- | 110 | 4 | -- | -- | 0. |

"The results of this survey are particularly interesting, for low temperatures during the winters of 1933-34 and 1934-35 killed off practically all of the imported parasite *Chaetexorista javana* B. and B. A collection made in April 1935 of 464 cocoons produced only 3 living and 5 dead *Chaetexorista* larvae. The collections of 1937 indicate that the parasite is building up rapidly again at a number of points. Under suitable conditions the parasitization should increase to the high percentages prior to 1934. The scarcity of the host at several of the points can hardly be attributed to the low temperatures, as mortality of overwintering moth larvae from the collections made in April 1935 was only 10 percent."

Insecticides for gypsy moth.--S. F. Potts, New Haven, submits the following from a report: "The gypsy moth can be controlled by a spray containing from 5 to 8 pounds of derris (4 percent rotenone) per 100 gallons of water. When from 0.5 to 1.0 gallon of fish oil or linseed oil per 100 gallons of spray mixture is added the period of effectiveness of the derris was greatly prolonged and its adherence increased. Pyrethrum at a concentration of 3 pounds per 100 gallons of water was very effective against the small larvae and is promising as a measure of control of young larvae before they are dispersed by the wind. It is not very effective against large larvae. A thorough application should be made as soon as the eggs have hatched. Nicotine sulphate and nicotine tannate were not effective. Nicotine sulphate 1-1,000, however, when mixed with pyrethrum, increased the effectiveness of the latter by causing the young larvae to become active, spin down, and crawl over the sprayed surfaces."

Effect of low temperatures on Black Hills beetle larvae.--Recent low-temperature tests by N. D. Wygant, of the Fort Collins, Colo., laboratory, with larvae of Dendroctonus ponderosae Hopk., revealed that many of the larvae not killed by exposure to very low temperatures in a low-temperature cabinet are injured by the cold and are not able to complete development. Samples of 100 larvae each were exposed for 2 hours and 15 minutes at intervals of 2.5° F. over the critical range. Fifty exposed larvae were put in separate vials 9 by 33 mm, with pine phloem for food. The other 50 were left in paraffin cells in petri dishes for activity counts at 24-hour intervals. One test made on March 17 with larvae taken from ponderosa pine and exposed at -32.5° will illustrate the results: 58 percent of the larvae in the petri dishes showed activity after being placed at room temperature, but only 2 percent of the larvae in the vials with phloem were able to develop into adults. At that temperature all of the larvae were frozen solid when taken out of the cabinet. Apparently the freezing injured certain insect organs. Some of the survivors of the low temperatures were living at the end of 4 weeks but their action was feeble and abnormal and they were unable to feed on the phloem. A few of the abnormal individuals developed into puny adults without feeding. Although the feeding tests used to separate the abnormal larvae from the normal ones after exposure to low temperatures require additional work, the feeding test may prove to be the only accurate method of determining mortality.

Outbreak of Black Hills beetle on Roosevelt National Forest.--J. A. Beal, Fort Collins, reports that between the years 1923 and 1930 an outbreak of the Black Hills beetle occurred on the Roosevelt National Forest in Colorado and killed an estimated total of 100,000 ponderosa pine trees. Control operations on this forest from 1927 to 1930 successfully terminated this serious outbreak. From 1930 to 1935 the forest remained relatively free from infestation by this beetle but a general reconnaissance made in the winter of 1936 revealed the threat of another serious and widespread infestation.

Scattered groups of infested trees were found which had increased rapidly in number during the last season or two. Infestation was heaviest in the Elk Park, Estes Park, and Boulder districts, the same general country covered by the control work from 1927 to 1930. A general check-up on the number of infested trees indicated that about 8,000 required treatment before the summer of 1937. Approximately two-thirds of this number have been treated to date and control operations are planned so that all infested areas will be covered by the middle of June 1937. Following this work a general inspection of the areas will be made and the need for a later survey determined.

Phyllophaga luctuosa Horn, a 2-year form.--According to H. R. Johnston, of the Georgetown, S. C., laboratory, recent emergence of aged adults determines that the chafer P. luctuosa has a 2-year cycle in South Carolina. This is one of the two most injurious species of May beetles in the Southeast and causes extensive damage to coniferous seedlings in forest nurseries. It has a wide variety of hosts including deciduous stock, but is found principally in the adult stage feeding in pines and oaks. It flies from late in March or early in April to the first of September. P. prununculina Burm. is the other species of considerable economic importance. It appears toward the end of the flight period of P. luctuosa and continues until activity for the season ceases. Mr. Johnston's detailed rearing record is as follows: In the spring of 1935 a 5 by 15 foot plot was freed of grubs and screened above and below ground to prevent natural infestation by chafers. On June 12, 1935, adult P. luctuosa were introduced and allowed to deposit their eggs. The larvae developed to the second or third instar by the end of the summer and by the end of the following summer (1936) all had reached full growth. Adults emerged on the night of April 22, 1937, indicating a 2-year cycle for this species. Also at this time, the first adults of the season were taken in the open.

Dutch elm disease vector studies.--R. T. Webber, of the Morristown, N. J., laboratory, has submitted a report covering experiments which he conducted with the elm borer (Saperda tridentata Oliv.) in 1936. Adults that had been sprayed with a spore suspension of the Dutch elm disease fungus (Ceratostomella ulmi), as well as adults that had either issued from or been confined with material infected with the fungus, were placed in cages with small noninfected trees and logs. Totals of 156 trees, 100 logs, and approximately 3,000 beetles were used in the experiments. The Division of Forest Pathology, of the Bureau of Plant Industry, cooperated by supplying the spore suspensions and by examining the trees and culturing the numerous samples cut from the trees and logs at the conclusion of the experiments. The beetles fed principally on the leaves of the small trees. They first attacked the midribs and frequently the petioles. Both were often nearly severed. Later the beetles fed on the interveinal tissue. The bark of the young growth was also fed upon, although rarely to the extent that the sapwood was contacted. When ovipositing in the logs the female beetle was noted to seek a crevice in the outer bark where she made an incision with her mandibles. She then reversed her position and inserted her ovipositor in the incision, eventually contacting the inner bark where the egg was deposited. Most of the eggs were deposited just within the inner bark but occasionally some were more deeply embedded and rarely were adjacent to the sapwood. Mr. Webber thinks the results from the young trees are surprising, because beetles that had been sprayed with a spore suspension of the fungus fed so extensively on the midribs, petioles, and bark of the young growth. It would seem that failure to obtain infection was due to the fact that conditions at points where such feeding occurred were not suitable for the development of the fungus. Mr. Webber further remarks that the results may be indicative of the slight importance of Saperda tridentata as a transmitter of C. ulmi.

## GYPSY MOTH AND BROWN-TAIL MOTH CONTROL

Spraying supplies distributed.--The complete order of arsenate of lead, fish oil, hose, and couplings has been received at the main storehouse in Greenfield, Mass., and is being distributed to different points in the field in preparation for the start of the spraying season. Barbed wire for fencing in areas that are to be sprayed and from which livestock must be excluded is being distributed, and the fences are being erected. Thousands of yards of burlap, in 8-inch strips, used in banding trees in infested localities to trap the gypsy moth caterpillars, has been sent to various points.

Field meeting at Greenfield demonstrates silvicultural and gypsy moth work.--A meeting was held on April 14 at the C. C. C. camp at Greenfield, Mass., of superintendents of gypsy moth camps, some of the C. C. C. gypsy moth foremen, regular employees engaged in gypsy moth work, and other foresters and entomologists. Talks were given and a visit was made to some of the surrounding area, where a demonstration of silvicultural and gypsy moth work was observed. It is proposed to hold similar meetings later in the year.

Gypsy moth caterpillars beginning to emerge in western Massachusetts.--Young caterpillars were found on four egg clusters in Hatfield on April 20 and 21. This early hatching record is probably due to the location of the egg clusters. General hatching has not yet occurred. Conversely, the foliage in the Pennsylvania area seems to be slightly less developed than last year.

Part of heavy infestation in Hatfield, Mass., reserved for spraying.--A large woodland area in the town of Hatfield has been found to be heavily infested with gypsy moth egg clusters. As this infestation was found too late in the season to complete creosoting operations, about 80 acres have been reserved for spraying.

Many egg clusters found on junk iron.--W. P. A. workers engaged in creosoting work in a heavily infested area in Greenfield, Mass., found approximately 50 gypsy moth egg clusters in the upholstery, on the fenders, and under the dash of an old automobile discarded in a dump. Discoveries of this nature are not uncommon, and emphasize the necessity of inspecting junk materials before movement to points outside of the quarantined area is permitted.

Benefits of selective thinning reduced by careless logging operations.--Logging operations and the cutting of wood for fuel was carried on in two areas in Massachusetts that had been selectively thinned by W. P. A. gypsy moth crews. No attempt had been made to dispose of the branches and treetops, and it will probably be necessary for the workers of this activity to dispose of the debris in order that the stand of trees may receive the benefit of the original thinning work.

Lack of ice on Lake Champlain delays scouting of islands for gypsy moth.--No attempt was made to examine the tree growth on numerous small islands near the Vermont shore of Lake Champlain when scouting work was done in that vicinity last fall, because the examination of these islands could be done more economically during the winter months, when the lake was frozen. On account of the abnormally mild winter Lake Champlain at no time has been covered with ice thick enough to permit safe crossing to the islands. They cannot now be scouted until the lake is free from ice, so they can be reached by boat. It is the first winter since the barrier zone was established in 1923 that safe crossing of the lake on the ice was not possible for several weeks.

Hundreds of spraying permits obtained in Pittston, Pa.--More than 2,500 permits to spray in the residential areas of Pittston had been obtained up to April 24. In obtaining these permits it is necessary to contact each owner or tenant of property where spraying is needed and secure permission in writing to do the work. When a property owner or tenant refuses to give permission in writing to do the spraying where needed, his or her name and address is furnished to a representative of the Pennsylvania department of agriculture stationed at Wilkes-Barre, who sees that the treatment work is done under the authority of the State law.

New infestation found in Chestnut Hill, Pa.--An infestation of more than 150 gypsy moth egg clusters, covering an area of approximately 3/4 acre, was discovered in Chestnut Hill Township, Monroe County. Chestnut Hill is south of Tunkhannock Township and is just outside of the gypsy moth quarantined area. The infestation was found in woodland growth, the bulk of which was considered unfavorable for the development of the gypsy moth. The trees were from 6 to 24 inches in diameter, measured breast-high, and consisted of approximately 46 percent maple, 30 percent oak, 6 percent yellow and black birch, 6 percent white pine, 4 percent tupelo, 3 percent ash, and 5 percent of a mixture of hemlock, shadbush, and black cherry.

Railroad tracks patrolled in mountainous sections of Pennsylvania.--While scouting tree growth for gypsy moth egg clusters in mountainous, ledgy country along railroad trunk lines in Pennsylvania, it has been necessary to detail one man from each crew to patrol the right-of-way and remove the numerous large rocks dislodged by the scouts. The type of country is such that it is impossible to do the work thoroughly without dislocating rocks, and the patrol is essential to prevent accidents.

Beavers handicap gypsy moth work.--Large dams have been built by beavers in many of the streams in Penn Forest and Kidder Townships in Pennsylvania, and hundreds of acres of timber land have been flooded. Much difficulty has been experienced in scouting the trees that have not yet been killed in the more recently flooded areas. The water did not freeze sufficiently during the winter to enable the workers to walk safely on the ice, and in most instances the water has been so deep that they could not examine the trees with boots. These animals, once practically extinct in this section of the country, have now become so numerous in certain areas that State game wardens have found it necessary to trap them and move them to other sections where new colonies may develop. This procedure minimizes the damage that may be done by the beavers in any particular locality.

Dangerous scouting near surface coal mines.--Much difficulty has been experienced in examining sections in the Pennsylvania area where surface mine stripping has been done. In such areas the earth has been removed, and the coal obtained by means of large scoop shovels, leaving holes 150 to 200 feet deep and 1/4 mile or more in length. Examination of the tree growth, consisting chiefly of oak, on the edge of the mine stripping is very hazardous.

Two gypsy moth scouts extricated from quicksand.--While scouting a large swampy area in Madison Township, Pa., two of the men sank to their waists in quicksand. They were extricated with difficulty by other members of the crew and taken to solid ground. Because of the danger that more serious accidents might result from work in the quicksand area, scouting was discontinued there for the present. It will probably be necessary to examine this swamp area in the winter when it is frozen sufficiently to bear the weight of the scouts.

Burlap distributed to C. C. C. camps; personnel reduced.--Burlap is being distributed to the C. C. C. camps for use in banding trees during the summer. The more or less continual changes in men allotted to gypsy moth work and the reduction in personnel that appears imminent in all of the States may prevent the completion of the program. It has been learned that the camps in Connecticut where gypsy moth work is being done under the supervision of this Bureau will be reduced in membership from an average of from 300 to 400 to a maximum of 140 men. This will materially reduce the amount of work that can be done in that State.

Gypsy moth work started at new camp.--A crew of 20 men from the C. C. C. camp in Shrewsbury, Vt., has started gypsy moth work. The work at this camp will be nearer the barrier zone than that of the other Vermont camps. Exhibition material has been supplied to two camps in Vermont to be used at sportsman's shows in Bellows Falls and Brattleboro.

Brown-tail moth work.--In Maine scouting for brown-tail moth winter webs has been practically completed within the area under quarantine, except for a number of towns located on islands along the coast. Some crews are now scouting in a number of towns outside the quarantine line and two additional towns in Washington County have been found to be infested. Numerous webs are still being cut in New Hampshire but none have yet been discovered in Connecticut. Scouting work has been completed in most of the towns in Massachusetts. Scouting for brown-tail webs at two sites in Rhode Island, which were found to be infested last year, has been completed. Winter webs were found at both locations, but the infestations were much lighter than last year. A total of 44 webs were cut at the two sites, while more than 300 were found there last year.

## PLANT DISEASE CONTROL

First stem rust infection on barberry bushes observed April 19.--The first stem rust infection on barberries in the barberry-eradication area was reported from West Virginia on April 19. Since then pycnia have been reported on Berberis canadensis in West Virginia, and the first infection on barberries at the Foreign Plant Introduction Garden, Bell, Md., was observed on April 29. Aecia were observed on barberries in Wythe County, Va., on May 3. Pycnia were reported to be developing rapidly on barberry bushes in Minnesota on May 5.

Barberry eradication in Ohio.--According to Harry Atwood, State leader in charge of barberry eradication in Ohio, a total of 366,238 barberry bushes have been destroyed on 2,093 different properties in 42 counties in Ohio, since control work was undertaken with emergency funds in August 1935. During this period an average of 256 men were employed at an average man-year cost, based on total obligations, of $796.42. Mr. Atwood reports that conditions were favorable for field work throughout last winter. Many heavily wooded areas were surveyed and inspections were made in many of the larger cities. In checking winter work he finds that the salt treatment is just as effective during the winter months, when the ground is frozen, as during other seasons of the year.

Barberry eradication in Indiana.--Escaped barberries were discovered in Indiana early in the barberry eradication campaign and each year since new areas have been discovered in various parts of the State. In 1926 only about 60 known areas of escaped barberries had been found. From these areas, 103,363 bushes have been removed on 341 properties. To date, 152 such areas of escaped bushes have been found and 23 of these were found during the calendar year 1936. A total of 133,571 escaped barberries have been destroyed on 951 properties. During 1936, a total of 13,454 escaped barberry bushes were destroyed on 108 properties. These areas of escaped barberries were located in 69 counties and were distributed over the State in such a way that, unless kept under control, the bushes might be expected to eventually spread to every square mile in the State. To keep an area of escaped barberry bushes under control requires inspection at intervals frequent enough to prevent seedling bushes from growing into fruiting bushes. As a rule this inspection should be once in every 5 or 6 years until bushes are no longer found. In areas where only a few fruiting bushes have been found, two or three surveys will usually clean up the area. However, where several thousand fruiting bushes have been growing in an area for 25 to 50 years, the problem is more difficult. It may be necessary to inspect such areas at regular intervals for many years. Definite progress is being made in cleaning up areas of escaped barberries in Indiana, as evidenced by the fact that no bushes were found in 39 of the 152 escaped areas when the last survey of the area was made.

Pine-infection surveys.--Pine-infection surveys have been carried on recently in the North Central region in the St. Paul district of Minnesota and in Upper Michigan. In these surveys pines were examined for blister rust cankers and were recorded as not infected, infected, or too large to inspect. Data were also obtained on the number of cankers by probable years of origin. In Minnesota, during themonth of April, 978 pines were examined by a two-man crew. The percentage of infected trees found was 5.32. In the three Michigan Counties of Dickinson, Menominee, and Marquette, five plots were laid out in protected areas and five in unprotected areas. The protected areas showed 5.6 percent of the trees infected, of which 97.4 percent were clearly infected prior to 1934 when Ribes eradication was performed. The five plots established in unprotected areas showed an average of 35 percent of the trees infected. The majority of cankers found were on wood of 1933-35 growth.

Phenological data on blister rust.--L. W. Hodgkins reports that several fruiting blister rust cankers were observed in Massachusetts during the early part of April. One canker was found fruiting on March 28, which is very early for this region. In Virginia aecia were found just protruding through the bark of white pine on March 25. Cultivated gooseberries were reported to be leafing out in Franklin County, in southern Virginia, on February 19. A report from Michigan states that Ribes leaves were starting on plants along the lake shore on May 1, but farther inland the leaves had not yet appeared nor had the blister rust cankers reached the fruiting stage.

Spread of blister rust.--Blister rust infection on pine has been reported for the first time in Monroe and Sauk Counties, Wis. In Monroe County one blister rust canker was discovered on April 12, and in Sauk County three cankers were located on April 13. This is the first time blister rust has been found in Monroe County, either on pine or Ribes, whereas in Sauk County infection on Ribes had been previously reported.

## COTTON INSECT INVESTIGATIONS

Boll weevil control on Sea Island cotton in Florida and Georgia.--Investigations are being started this season designed to develop measures for the control of the boll weevil on Sea Island cotton. Practically no work of this kind has previously been done, because the former extensive plantings of Sea Island cotton disappeared with the advent of the boll weevil. During the past 2 years extensive plantings of Sea Island cotton have been made in Florida and Georgia. Sea Island cotton (Gossypium barbadense L.) and the upland varieties of Gossypium hirsutum L. are distinct species and because of the soft boll walls, late maturity, and dense foliage of the Sea Island cotton, it appears that the boll weevil will be more difficult to control on it than on the upland cotton. Investigations for the 1937 season are underway in southern Georgia in cooperation with the Georgia Coastal Plains Experiment Station at Tifton; in eastern Georgia along the Atlantic coast, in cooperation with the State Entomologist of Georgia; and in Florida, in the vicinity of Gainesville, in cooperation with the Florida Agricultural Experiment Station.

A new root weevil situation in Florida.--On May 14, 1937, J. R. Watson, of the Florida Experiment Station, and U. C. Loftin, Washington, D. C., made a brief survey of the area infested by Naupactus leucoloma Boh. in western Florida. Mr. Loftin reports that only a limited area appears to be infested. This is located in the northeastern corner of Okaloosa County and northwestern corner of Walton County in Florida and along the southern border of Covington County, Ala. The infested area seems to center around Svea. Svea is about 20 miles north of Crestview, Fla., and is between Laurel Hills, Fla., and Florala, Ala. The area infested is a typical scrub oak, wiregrass country with poor sandy soil. Apparently it is confined within a radius of 5 miles of Svea. It has apparently been present for several years, as a number of farmers were acquainted with it. The local name is "pender worm", or cotton "billbug." The damage is caused by the larvae feeding on the roots of the plants. The lower part of the stem and taproot are chewed away, but no damage was noted on the smaller lateral roots. Peanuts, cotton, corn, and velvetbeans were the only plants found infested, though limited examinations were made of miscellaneous vegetation growing on the ditch banks, and of cowpeas, turnips, and collards. In cotton the epidermis and usually about half of the woody stalk was eaten from 1 to 5 inches below the soil surface. The feeding areas were an inch or more in length and only occasionally was the stem or root completely severed, as in cutworm injury. On corn a round hole from ¼ to ½ inch in diameter is cut into the main stem, resembling the work of the corn billbug, but considerably larger in diameter. The holes seldom penetrate more than midway of the stalk. On the stems of seedling peanuts, which are larger and fleshier than cotton or corn, the feeding areas were shallower and were typically a general gnawing of the epidermis. Only a few small velvetbean plants were observed and the damage to them was more like that on cotton. All of the damaged plants observed were only a few inches tall. Most of the larvae found were rather uniform in size--about ½ inch long--and a few were apparently preparing to form cells and pupate. A few smaller larvae, about two-thirds the size of the larger ones, were taken. In most cases the larvae were within a radius of 2 or 3 inches of the plants but in some places where the plants had been killed, the larvae were several feet from them. The infested plants turn yellow, wilt, and die. A part of a large field of cotton on the farm of J. Duff Reeves, containing from 75 to 80 acres, was examined, where the stand had been seriously damaged. The cotton had been chopped and plowed and skips of three or four plants were common. In some rows all of the plants had been destroyed for 30 to 50 feet and in general 20 or 25 percent of the plants were destroyed in the part seen, which was the most damaged. As many as five or six larvae were found around one cotton plant, and two or three per plant were quite common. This part of the field had been planted to peanuts last year and the county agent reported that crops following peanuts were damaged more than when planted after other crops. A few volunteer peanuts were growing in this cotton and there did not seem to be any particular preference for this plant. A field of several acres of corn following peanuts last year on the farm of M. S. Johnson was also badly damaged. In the only field of peanuts examined the plants were quite small. They were planted on land that was in peanuts last year and were not heavily damaged. The county agent stated that the peanuts were all killed last year on at least an acre of this field, but that hogs had been pastured on it until March of this year. We could not find any grubs under the peanuts, although they were fairly abundant in the other part of the field, planted to corn. Apparently the hogs had eaten the overwintering insects or rooting and moving the soil had caused them to die. Adults appeared about the first of July last year and were seen only a short time, so there is apparently only one generation a year. The county agent reported the weevils were taken on the leaves of cotton and peanuts where they appeared to be feeding to some extent. The winter is probably passed as eggs or small larvae in the soil. The first report of the appearance of this weevil in this county was made by the Division of Insect Identification in the Bureau News Letter dated September 1, 1936, when it was reported that L. L. Buchanan had identified as N. leucoloma Boh. two specimens received from A. N. Tissot, of the Florida Agricultural Experiment Station. These weevils came from this area near Crestview, Fla., and at that time were reported to be injuring peanuts. In the October 1, 1936, Insect Pest Survey Bulletin J. R. Watson reported this insect had appeared during the summer in the northern part of Walton County, Fla., and in adjacent areas in Alabama, where it was causing much damage to peanuts and some injury to cotton and other plants.

## PINK BOLLWORM AND THURBERIA WEEVIL CONTROL

Wild-cotton eradication.--The eradication of wild cotton in southern Florida has continued to make excellent progress. During April the crews were at peak size and at least as much work was done as during any single month since this activity has been under way. A small virgin colony of cotton was located and removed in Hillsborough County and another in Pinellas County, on the west coast. With the exception of one virgin plant found in 1936, these were the first virgin plants found in either of these two counties in 2 years. The missing of the colonies is due to the fact that the area had been burned over a number of times and crews had to come along at just the right time in order to locate the cotton. The program on Cape Sable has practically been completed for the season. A large portion of this area has been recleaned twice since December. The only portions not recleaned a second time were those worked late enough in the season so that seedlings have not yet begun to grow. The eradication work is undoubtedly in the best condition it has ever been. The pink bollworm infestation in wild cotton in southern Florida was first discovered in June 1932 and since that time a number of surveys have been made by truck and boat in an effort to locate all of the wild cotton. There was a large area that had never been covered because it could not be gotten into by walking nor reached by boat. It is principally the section known as the Everglades. An autogiro owned by the Dutch elm disease project was loaned to this project and arrived in Miami on March 19. This plane was used to make a survey of the section that had never been covered before. In covering the area all high ground known as hammocks and shell mounds, which might be capable of sustaining wild cotton growth, was charted on a map. Approximately 1,900 square miles were covered with the autogiro and 24 new hammocks and shell mounds that might contain wild cotton were located. It will be a fairly simple matter now to reach these points to see whether or not they contain cotton. Of equal importance is the fact that many hundred square miles can now be eliminated from any further consideration with respect to the wild cotton program. Various inspectors of the project served as observers during the flights. In addition to locating the new points where cotton might occur and eliminating a large area, the inspectors who served as observers have gained a much better knowledge of the area in which they are working. It has been estimated that the cost of the surveys made by truck and boat was approximately $17.50 per square mile, whereas the cost of the survey with the autogiro was approximately 44 cents per square mile.

Thurberia-plant eradication.--Satisfactory progress has been made with the eradication of Thurberia plants in the Santa Catalina Mountains of southern Arizona. During the month 1,240 acres were covered and 14,147 Thurberia plants were destroyed. This makes a total of 100,505 acres that have been covered and 1,110,003 Thurberia plants that have been destroyed. Toward the end of the month all of the area readily accessible from the camp in Sabino Canyon had been covered; therefore a new camp site was located in Romero Canyon about 8 miles westward, and the camp was moved to that point. Several hundred acres have already been worked from the new camp without finding any plants. This acreage, however, was at a higher elevation than any plants have ever been found. It is known that there are numerous Thurberia plants in this new area at lower elevations.

Laboratory inspection.--Laboratory inspection is now going forward at San Antonio and most of the field stations. The most interesting phase of this activity was the inspection of green bolls collected last fall in the heavily infested areas. For the past 3 years a sample of 100 green bolls has been collected annually from 20 fields located throughout the cotton-producing section of the two heavily infested areas. An effort was made to select fields that had been planted to cotton each year. One of the fields was not planted to cotton, therefore bolls were collected from the nearest field. When this plan was first inaugurated there was some doubt as to whether or not very small larvae could be found in green bolls after they had been preserved for some time. To obtain definite information on this point, duplicate samples of bolls were collected the first year. One set of samples was inspected immediately after the bolls were collected and the other was preserved and inspected several months later. The results were practically the same in each case, thus establishing the fact that specimens could be found as easily in preserved bolls as in fresh bolls. In Brewster and Presidio Counties, known as the Big Bend of Texas, the results of the 1936 crop inspections show that there are 9 fields which contain a larger number of worms per acre than in 1935, and 11 which contain a smaller number. In Brewster County the number of worms per acre was heavier than during the two preceding years. This is perhaps accounted for by the fact that a small field of cotton was planted very early in the spring of 1936 and served to breed up large numbers of worms to infest the bulk of the crop, which was planted later. In Presidio County the number of worms per acre was less than in the previous year, although the general impression was that actual damage by the pink bollworm was heavier. During August 1936 there was considerable rain and cloudy weather and possibly this condition led to the decay of a large number of bolls as a result of moisture getting into them by exit holes made by the pink bollworm. Thus there could have been more damage as a result of the peculiar weather conditions, even though the actual number of worms present was smaller. In the heavily infested part of Hudspeth County, Tex., the inspections indicate that infestation seems to be building up. There were 14 fields in which the number of worms per acre was higher than in the preceding year, 3 fields in which the number was less, and 3 fields in which no infestation was found.

## TRUCK CROP AND GARDEN INSECT INVESTIGATIONS

Nicotine-peat moss dust mixture not effective against common species of cabbage worms in Louisiana.--C. E. Smith, of the Baton Rouge, La., laboratory, reports that in field experiments involving several species of cabbage worms (principally Autographa brassicae Riley, Hellula undalis Fab., and Ascia rapae L.), a dust mixture of peat moss containing 2 percent nicotine was distinctly inferior in insecticidal efficiency to derris dust mixtures containing 0.5 and 1.0 percent rotenone, as well as to an undiluted tri-calcium arsenate. There was practically no difference between the efficiency of the derris dust containing 0.5 percent rotenone and that of tri-calcium arsenate, but a derris dust mixture containing 1.0 percent rotenone was distinctly superior to the other three materials tested, when applied at intervals of 2 weeks.

Disease reduces mole cricket population in Florida.--J. N. Tenhet, of the Sanford, Fla., laboratory, reports that the abundance of mole crickets (Scapteriscus spp.) is being reduced in the Sanford district, apparently by a disease. The decrease was noted during the fall of 1936, but it was not until March 1937 that the cause became apparent. The causal agent has been determined by Vera K. Charles, of the Bureau of Plant Industry, as probably Sorosporella uvella, which is either closely related to or identical with the organism that attacks the corn earworm.

Tolerance of narcissus forcing bulbs to thermal treatments.--Observations at the Babylon, N. Y., laboratory, by Randall Latta and F. S. Blanton on the flowering of narcissus bulbs which had been subjected to vapor-heat or hot-water treatments during August, September, and October 1936 for the control of the bulb nematode (Ditylenchus dipsaci (Kuhn) Filipjov) and other bulb pests disclosed the following information: (1) Bulbs treated in vapor heat for 6 and 8 hours at 110° F.; for 6 and 8 hours at 112°; for 4 and 6 hours at 114°; for 4, 6, and 8 hours at 116°; and for 4, 6, and 8 hours at 118°, following a 2-hour presoaking at 70° to 80°, all failed to produce normal crops of flowers when forced. (2) Results were similar with bulbs treated in hot water for 4, 6, and 10 hours at 110°; for 3, 4, and 5 hours at 112°; for 3, 4, and 5 hours at 114°; and for 4 and 6 hours at 116°, following a 2-hour presoaking at 70° to 80°. (3) All but 14 of the tests resulted in serious reduction of the number of flowers produced, and all had at least 50 percent of the flowers injured. (4) The bulbs were more tolerant to preheating than to presoaking. (5) Formalin added to the treating water in hot-water treatments was slightly detrimental, but showed no injurious effect when added to presoaking water in vapor-heat treatments. (6) The varieties Emperor, Tresserve, Spring Glory, Glory of Sassenheim, Golden Spur, Glory of Lisse, and Laurens Koster all proved to be more tolerant to thermal treatments than was King Alfred. (7) Midseason treatments were tolerated better than late-season treatments. Samples of hyacinths, tulips, and bulbous iris all failed to bloom and in many tests failed to grow when given thermal treatments late in the season.

*Role of insects in disseminating azalea flower spot*.--Observations and experiments during January, February, and March, at Charleston, S. C., by F. F. Smith and R. H. Nelson, of the Beltsville, Md., laboratory, involving 1,600 inoculation tests, indicated that insects do not bring the organism causing the azalea flower spot disease into gardens or nurseries to cause infection on the flowers appearing early. The appearance of the earliest infections on flowers close to the ground indicated that the soil or mulch may be the hold-over source between flowering seasons. It was found that with the increase in the number of insects that visit the azalea flowers, notably the bees *Bombus* spp., *Xylocopa* spp., and *Emphoropsis floridana* Smith, a decided increase occurred in the general spread of the disease on all parts of azalea plants. The percentage of infective insects increased in collections as the disease became more prevalent, one adult of *Xylocopa virginica* (Dru.) causing 19 infections in one test. Evidence was obtained that insects carried azalea flower spot infection to a nursery 1 mile distant from the nearest azalea planting. An adult of *Bombus bimaculatus* Cress., bearing paint applied to bees visiting azalea flowers in one garden, was captured 8 days later in another garden 5 miles distant. The disease was transmitted experimentally by means of insects to wild azalea (*Azalea nudiflora* L.) but not to huckleberry (*Vaccinium*). In transmission tests, comparing the infections on untreated flowers and on flowers dusted previously with a fungicidal dust containing 20 percent monohydrated copper sulphate, a reduction of 45.4 percent was obtained in the number of bees causing infection and a reduction of 64.4 percent in the number of infections on the dusted flowers, as compared to the undusted ones.

*Vacuum fumigation of cigarette beetle larvae with ethylene oxide-carbon dioxide mixture*.--According to data obtained by E. M. Livingstone and W. D. Reed, of the Richmond, Va., laboratory, it appears that a commercially prepared ethylene oxide-carbon dioxide mixture cannot be used successfully for the fumigation, under partial vacuum, of tobacco bales infested by larvae of the cigarette beetle at winter temperatures. During the latter part of March three experiments were performed with this mixture on Turkish tobacco, using dosages of 60.8 pounds and 91.0 pounds, respectively, per 1,000 cubic feet. At the end of 4 hours, approximately 50 percent of the test insects placed within the bales were killed and at the end of 24 hours the mortality ranged from 83 to 91 percent. No significant difference could be detected between the performance of the two different dosages used. The temperatures within the tobacco bales ranged from 53° to 54° F. A total of 4 experiments were also performed with Puerto Rican cigar filler tobacco, using a dosage of 58.7 pounds of the mixture per 1,000 cubic feet in each test, with an exposure of 4 hours. In these experiments the mortality of Lasioderma serricorne Fab. ranged from 9.6 to 80 percent for the test lots of insects removed from the bales at the expiration of 4 hours, and from 56.8 to 88.8 percent for the insects left in the bales 24 hours after exposure. The temperatures within the tobacco bales during these experiments ranged from 48° to 56° F.

Insects in skunk droppings.--H. C. Mason and B. J. Landis, of the Columbus, Ohio, laboratory, report that an examination of skunk droppings, which measured approximately 1½ inches long by ½ inch wide, collected in a bean field at South Point, Ohio, during June 1935 disclosed the remains of a total of 409 adult insects, including: Epilachna varivestis Muls., 6; Ceratomegilla fuscilabris Muls., 1; Hippodamia convergens Guer., 1; Elateridae, 9; small Coleoptera, 22; Rhynchophora, 1; Carabidae, 3; large Coleoptera, 1; Orthoptera, 1; and small Hymenoptera, principally ants, 364.

Multiple parasitization in hornworm larvae.--On several occasions Mr. Landis has observed that the tachinid parasite Sturmia distincta Wied. issued from the same larva of the hornworm Protoparce sexta Johan, which also produced Apanteles congregatus (Say). Dissection of such larvae, which had been subjected to multiple parasitization, disclosed that S. distincta larvae were present in the alimentary canal of the host, whereas in none of the examples examined was there any evidence that the larvae of A. congregatus had penetrated the alimentary canal. The latter species normally emerges from the host and pupates 2 or 3 weeks earlier than does S. distincta.

## INSECTS AFFECTING MAN AND ANIMALS

Seasonal incidence and hosts of the Gulf coast tick.--E. F. Knipling, Valdosta, Ga., reports that no adults of this tick were found on livestock up to the middle of April. Collections of birds during March and April in the vicinity of Raymondville, Tex., indicated considerable activity of the immature stages of this tick. A few larvae were active in March but none were collected in April. Here, as in the Southeastern States, the meadowlark is an important host of the immature stages of this tick, which were found in abundance on this host until about April 1. After that date a marked decrease in numbers was noted. Other birds found to be infested with immature stages of the Gulf coast tick in the vicinity of Raymondville are cowbird, boat-tail grackle, field sparrow, and plover. As these birds are fairly numerous in the area, they may be important in the development of immature stages of this tick.

Dispersion of the primary screwworm fly.--D. C. Parman, Uvalde, Tex., reports that records on the dispersion of the primary screwworm fly indicate that the northward movement has been equally as fast as that noted last year. This dispersion averaged about 35 miles per week last year. The westward movement seems to have been especially fast this spring, as the fly was present at Balmorhea, Tex., on or before April 26. Failure to find specimens of this species in the Big Bend district up to that date indicates that migration did not reach Balmorhea from the Big Bend.

Build-up of primary screwworm fly in southern Texas.--Mr. Knipling and W. L. Barrett, Jr., report that screwworms were active in southern Texas during the latter part of the winter, the greatest activity apparently occurring in Willacy County and the northern part of Cameron County. The first noticeable increase in activity in this region was reported during the last week in February and continued to increase thereafter. The early high population in this vicinity was evidenced by reports of stockmen and by the large numbers of Cochliomyia americana C. and P. trapped in Willacy County early in March. By the last of April the population apparently was still on the increase and was higher in Willacy County than in any of the other lower Texas counties. In the farming section in the southern part of Hidalgo and Cameron Counties the fly population was apparently low during the first half of March and, at least in Hidalgo County, continued to be low until the latter half of April, when the number of flies trapped showed a definite increase. As might be expected, the fly population did not build up as rapidly in the farming section as in the range country. The records on C. americana abundance, as determined by the operation of meat-baited fly traps, appeared to tally very well with reports of screwworm attack on livestock in this part of Texas.

Hibernation studies on the primary screwworm fly.--A. L. Brody, Valdosta, Ga., reports that C. americana was able to survive the winter of 1936-37 in outdoor screened cages. Although breeding was slowed down considerably, sufficient breeding occurred throughout the winter to carry the species through at Valdosta, Ga. At this locality C. americana adults developed and emerged within 44 days from larvae dropped on February 13 and 23 on different types of soil and from pupae buried within 2 inches of pasture sod. At Gainesville, Fla., C. americana was also able to survive the winter in outdoor screened cages. The length of each generation was increased, but sufficient breeding occurred throughout the winter to carry the species through without difficulty.

New laboratory for screwworm investigations.--On May 15 a new set-up was established at Menard, Tex., for a more intensive study of the screwworm problem under typical ranch conditions. This laboratory is located about 2 miles west of Menard. Roy Melvin has been placed in charge. A typical ranch tract of about 1,300 acres has been leased and arrangements have been made to run several hundred head of sheep and goats and a number of cattle on this tract.

*Calcium arsenite vs. mosquito larvae*.--W. V. King reports on preliminary laboratory experiments with the use of calcium arsenite as a substitute for paris green in destroying Culex larvae. One sample tested contained approximately 2.5 percent water-soluble arsenic and the other 8 percent. On the basis of killing time, the latter showed the higher toxicity and was intermediate in this respect between the two best samples of paris green. The other sample showed about the same killing time as the third sample of paris green. While the calcium arsenite has not been prepared commercially, we are advised that it can be manufactured at a much lower cost than paris green. If so, the results of these preliminary tests indicate that it may prove to be a satisfactory substitute for the more expensive material.

*Cattle lice controlled by rotenone spray*.--R. W. Wells reports promising results in the control of both biting and sucking lice of cattle with the use of a spray consisting of 1/2 g of rotenone in 100 g of carbon tetrachloride. Although much more experimental work is required in this field, the following tentative conclusions may be drawn: (1) It is a rapid and simple method of treatment, and very prompt in its effect on the lice. (2) The eggs are apparently not vulnerable to the treatment as used. (3) Treating a large animal thoroughly will require about 100 cc of the solution and younger animals will require less, down to about 50 cc for the smallest calves. (4) The cost of carbon tetrachloride makes the treatment more costly in materials used per animal than powders of diluted derris or diluted Cracca.

*Tests of derris, tephrosia, and sulphur against cattle and horse lice*.--H. O. Schroeder draws the following tentative conclusions from a series of tests of these dry insecticides to cattle and horses for the control of lice, the following species being dealt with: *Haematopinus asini* L., *Trichodectes pilosus* Giebel, *H. eurysternus* Nitz., *Linognathus vituli* L., and *T. scalaris* Nitz. (1) A derris-tripoli earth mixture containing 1/8 of 1 percent rotenone is an efficient insecticide in controlling both Anoplura and Mallophaga on cattle and horses. (2) Tephrosia was found to be as effective as derris when the rotenone concentration was the same. (3) From 1 to 4 ounces of dust, depending on the size of the animal, is sufficient to give good coverage. (4) No evidence was found to indicate that the rotenone or sulphur dusts had any effect on the eggs. Thus subsequent applications are necessary to effect complete control. (5) The cost of the derris in a dust with a rotenone content of 1/8 of 1 percent was only 1¼ cents per pound. (6) In general, sulphur, as used in these tests, was less efficient than dusts containing rotenone, although in some instances infestations were reduced by as much as four-fifths.

## FOREIGN PLANT QUARANTINES

*Entomological interceptions of interest*.--One hundred and thirty-nine living larvae of the fruit fly *Anastrepha suspensa* (Loew) were collected on October 30, 1936, in fruits of India-almond (*Terminalia catappa*) in the field at Arecibo, P. R. Four living larvae of the pepper weevil (*Anthonomus eugenii*

Cano.) were intercepted at Nogales, Ariz., on March 9 in bell peppers in cargo from Rosales, Sinaloa, Mexico. Living specimens of the mirid Eurycipitia splendens Dist. were taken at Washington, D. C., on December 24, 1936, on orchid (Cattleya sp.) plants in express from Colombia. The soursop chalcid (Bephrata cubensis Ash.) arrived at Miami, Fla., on January 9 in fruit of soursop (Annona muricata) in ship's stores from Jamaica. This eurytomid, which is recorded from Florida, has been intercepted in Annona spp. from Central and South America, Mexico, and the West Indies. A larva of Sericus brunneus L. was found at Chicago, Ill., on December 24, 1936, in a case of Manetti rose stock in cargo from the Netherlands. This elaterid is not recorded from the United States and possibly represents a potential pest. Four living larvae of the West Indian sweetpotato weevil (Euscepes batatae Waterh.) were intercepted at Mobile, Ala., on January 9 in sweetpotato roots in ship's stores from Cuba. Living adults of the weevil Apion pomonae F. arrived at New Orleans on January 14 and 15 in seed and pods of vetch in cargo from France. The vetch was mixed with rye straw used as packing for wine. An adult of Bruchus luteicornis Illiger was taken at Baltimore on September 4, 1936, in a seed of Vicia grandiflora in cargo from Hungary. Palaeopus costicollis Marsh. was found at New York on December 17, 1936, in a yam root in baggage from Jamaica. Concerning the yam weevil, L. L. Buchanan reports that P. dioscoreae Pierce is a synonym of P. costicollis Marshall. One hundred and seventy-seven living larvae of the turnip gall weevil (Ceutorhynchus pleurostigma Marsh.) were intercepted at Philadelphia on February 11 in white turnip roots in ship's stores from England. Fifty-five living larvae of this weevil were taken at the same port on February 12 in rutabaga roots in ship's stores from England.

Pod borer in beans from Mexico.--A living pupa of Maruca testulalis Geyer (?) was taken at Nogales, Ariz., on March 13 in a lima bean pod in cargo from Acaponeta, Nayarit, Mexico. While this is the first record of this insect being intercepted from the West Coast of Mexico, three living larvae of the bean pod borer (M. testulalis Geyer) arrived at Laredo, Tex., on January 15, 1935, in string bean pods in cargo from Cuauhtemoc, Tamaulipas, Mexico.

Philippine orange moth in sour limes.--Living specimens of Prays citri Miller were intercepted at San Pedro, Calif., on February 14, 1937, in sour limes in ship's stores from the Philippines. Out of a lot of 23 sour limes, 6 were found to be infested. This hyponomeutid has also arrived from Greece, Guam, Italy, and Java. In addition to sour lime, it has also been intercepted in grapefruit, lemon, orange, and sweet lime. This insect causes galls by boring into the rind of the fruit and also injures the blossoms of citron (Citrus medica), lemon, and orange.

Pathological interceptions of interest.--Albugo candida (Pers.) O. Kuntze was intercepted at New York on April 1 on radishes from Argentina. Aplanobacter michiganense E. F. S. was intercepted at El Paso on April 7 on tomatoes from Mexico. Other interceptions have been received from Mexican border ports since then. Ascochyta pisi Lib. was intercepted in hairy vetch seed from Czechoslovakia on March 13 and on Vicia faba from Italy on April 1 at New York. Ceratostomella fimbriata (E. and H.) Elliott was intercepted from Belgium on April 20 at Houston, from Belgium and England on April 22 at Port Arthur, from France on April 22 at Savannah, and from Germany on April 25 at Mobile, all on carrot, indicating that the disease is rather widespread on this host in Europe. *Diplodia natalensis* Ev. was intercepted on tomato fruit from Mexico on January 21 at Nogales. *Gloeosporium sansevieriae* Verw. and Dupl. was intercepted on *Sansevieria* from England on April 8 at New York. The only previous interceptions have been from Bermuda and Puerto Rico. *Gloeosporium* sp. on pepper from Cuba intercepted on April 16 at Mobile does not fit descriptions of species usually found on this host. *Mycosphaerella citrullina* (C. O. Smith) Gross. was intercepted on April 10 at Philadelphia on pumpkins from South Africa. *Peronospora effusa* (Grev.) Ces. was intercepted on spinach from Mexico on March 27 at El Paso and at other border ports later and from Belgium on April 16 at New York. *P. valerianae* Trial was intercepted for the first time on March 10 on *Valerianella locusta* var. *olitoria* from France at New York. *Phomopsis* sp., no species reported on host, was intercepted on pods of *Myroxylon* from Trinidad on November 1, 1936, at New York. *Puccinia bouteloque* (Jennings) Holw. was intercepted for the first time on June 4, 1936, at New York on *Bouteloua* sp. from Mexico. *P. mayorii* Ed. Fischer, first interception, was found on *Sideritis theezans* at New York in mail from Greece on January 11, 1936. *Rotylenchus bradys* (Steiner and LeHew) Filipjev was intercepted in yam (*Dioscorea alata*?) from Cuba for the first time on April 16 at Mobile. Morning-glory roots from Japan intercepted April 14 at Philadelphia were found to have minute black sclerotia about 20 *mu* in diameter scattered all through the tissue and only a few *mu* apart. *Septoria anthrisci* Pas. and Brun. was found on leaves of *Anthriscus cerefolium* from Italy on October 21, 1936, at New York, first interception. *Sphaceloma perseae* Jenkins was intercepted on avocados from Colombia on April 22 at New York. This appears to be the first report of the disease from Colombia. *Vermicularia trichella* Fr. was intercepted at New York on January 23 on ivy from Norway.

*Spotting of citrus from Mexico*.--For 2 or 3 years citrus from Mexico has been intercepted at border ports and forwarded for determination of the cause of the more or less severe spotting that marred the appearance of the fruit. Microscopic examination of these spots failed to reveal any organism and citrus disease specialists of the department were unable to diagnose the trouble. Last fall arrangements were made to turn material of this nature over to Chas. Brooks, of the Bureau of Plant Industry, for study. A request was sent to several border ports to be on the lookout for spotting of citrus fruit from Mexico. Dr. Brooks examined and cultured numerous specimens turned over to him and reports that he has been unable to obtain any organism from the affected spots. It would appear that if this trouble is infectious, as is claimed by some growers, it is probably a virus disease. Dr. Brooks is unable to offer any explanation for the spotting.

*Customs inspectress aids plant quarantine inspector*.--A passenger from Kingston, Jamaica, was met at the New York pier by her sister, who had obtained a pass beyond the barrier through the courtesy of the Customs. During the inspection of the passenger's baggage the visitor picked up a coat belonging to the passenger and threw it over her arm. She objected violently to examination of the coat, insisting it was hers. The inspectress involved, having seen her pick up the coat, suggested that rather than have any scene during the baggage inspection she would tip off the guard at the barrier to search the coat. When the visitor went through the gate the Customs guard searched the coat, again under protest, and found three mangoes in the pockets. The plant quarantine inspector was called and he in turn called the Customs Deputy, as the visitor at that time denied ownership of the coat saying she had picked it up in error.

Infested oranges peeled and served.--On February 20 and again on February 23, dipterous larvae, identified as *Anastrepha ludens* Loew, were taken from fruit collected on the Pan American plane from Mexico City. The circumstances surrounding these interceptions are of more than passing interest. In each case the larvae were taken from oranges which the company places on their planes flying between Mexico City and Brownsville for consumption by the plane's passengers. Before they are put aboard these oranges are peeled and quartered, so that they may be eaten with the minimum amount of effort, a procedure which should preclude the possibility that this fruit would be found infested. However, some was infested and this may be explained by the fact that the Mexican fruit worm, when it infests navel oranges, usually works in the navel section of the fruit, the only part of the fruit that was not cleft in the above instances.

Strike prevents inspection.--An incident at the port of Seattle is recorded as an example of how circumstances over which we have no control may affect the safeguarding of foreign plant material. A shipment of 60 cases of fresh persimmons arrived in Seattle on the American S. S. *President* Jefferson for T. and E. movement to Canada. This shipment arrived on November 11 but, owing to strike conditions at that port, was not exported to Canada until February 15. During the period November 11 to February 15 there was no crew on the vessel and it was impossible to obtain permission from the Longshoremen's Union to remove any of the cargo, therefore the persimmons, together with a great many shipments of lily bulbs consigned to Europe and Canada, had to remain on board the S. S. *President Jefferson* until the strike had been settled.

Attempted smuggling of Mexican citrus fruit.--Recently two couples crossed the Laredo Bridge into Mexico. While there they purchased 200 oranges, intending to take them back to Arkansas with them. The oranges were taken up at the bridge and one fruit fly larva was found in one of them. Three elderly women arrived on the bridge at Laredo on their way back from a trip to Mexico. After their baggage had been removed, the inspector asked if they had any fruits or plants about the car. One of them replied that they had three oranges left. Three oranges and one sweet lime were found in a basket on the front seat of the automobile. The inspector took them, continued to search the car, and found other fruit concealed in the sleeve of a coat. He asked the ladies if these three oranges were all the fruit that they had about the car, and they declared that it was. The inspector produced from the aforementioned coat sleeve (which had been fastened at each end with safety-pins to keep the fruit from rolling out) six oranges and three sweet limes hidden therein. One of the women paid the $2 fine assessed without protest.

## DOMESTIC PLANT QUARANTINES

Peach mosaic disease.--Cooperative Federal-State inspection for the peach mosaic disease in the infected States is well under way with a force of 75 inspectors. In Colorado the present indications are that there is approximately one-fifth as much mosaic in the affected area as was found last year. Such decline of the disease is apparently due to the prompt and complete eradication of infected trees in 1935-36. Reports from Texas state that in the El Paso district eradication work is being performed on 90 percent of the properties on which the disease occurs. Eradication is being conducted along with the inspection as soon as the consent of the owners is obtained. In the eastern half of Texas 12 inspectors are inspecting the 5-mile zones surrounding nurseries and the sources of budding wood used in such nurseries. A disease-free radius of 5 miles, as determined by careful and competent inspection, is required as a standardized condition of certification for shipping from infected areas, under recently established State quarantines. The California survey indicates an increase in the disease of one to five times over that of last year. The tree-removal project is continued cooperatively with the State, providing employment for approximately 125 workers. Good cooperation is being obtained from owners of infected properties. So far as is known, California and Colorado are the only States where the disease exists in extensive commercial peach areas. Infections in other States, namely, Arizona, New Mexico, Utah, and Texas, are confined to areas not so important commercially. The results of the field work of the past two seasons indicate that if inspection and eradication are continued the spread will be checked and the disease eradicated before extensive economic losses are sustained.

Phony peach inspection.--With a force of approximately 75 Federal and State inspectors, extensive scouting in affected States is being conducted to determine the spread of the phony peach disease. To protect accomplishments of past years, and especially the favorable status at the close of the 1936 season, it is extremely desirable to reinspect in 1937 all known infected properties in order to find diseased trees in which symptoms were not visible last year. The campaign has now accomplished economic control, even in the heavily infected areas, and it is not unreasonable to expect ultimate eradication under such a continued program of inspection in subsequent years.

Transit-inspection activities.--During the spring season for shipping nursery stock transit inspection has been carried on at 16 of the more important terminal centers throughout the United States. In the first 4 months of 1937, approximately 600,000 shipments moving via mail, express, and freight have been inspected, of which approximately 1,000 were found to be consigned in violation of quarantines relating to the Dutch elm disease, the Japanese beetle, the gypsy moth, the black-stem rust of grains, the pink bollworm, the white pine blister rust, and the Mexican fruit worm.

White pine nurseries inspected.--Fifty-six applications have been received for permits to ship white pines during the fiscal year 1938 under the provisions of Federal quarantine No. 63, from States infected with blister rust, and the inspection of such nurseries is being made in the Middle West and also in Eastern States. Indications are that a number of nurserymen are making arrangements to increase their sowing of white pine seed this summer to meet the increased demand for stock for reforestation purposes. An unusually large number of shipments of seedling forest stock is reported by the transit inspector at Pittsburgh.

Citrus canker activities.--Inspection for citrus canker and the destruction of abandoned groves and of Citrus trifoliata was begun in west Florida in April. This is a continuation of the project in the contiguous area in southern Mississippi and Alabama where thorough inspection has been made of the entire citrus-growing districts, comprising eight counties. No canker was found in these recent inspections; however, over 5,000,000 worthless citrus trees have been destroyed in Mississippi and Alabama up to April 24, under the emergency project. In Louisiana and Texas persistent search for the canker is continued from year to year in all citrus-growing areas in order to find and eradicate the last vestige of this disease. In Louisiana the disease was found in April on one tree in Saint Charles Parish. Only three infected properties were found in that State in 1936. In Texas, although the disease has recently recurred on several properties in Galveston and Brazoria Counties and to a less extent in Harris County, the infected trees are chiefly seedlings of recent growth. These infected trees are promptly removed and the areas reworked with relief crews. The inspection work is conducted cooperatively with the States concerned.

Coast Guard furnishes boat for island inspection.--Citrus canker inspectors and relief crews in Mississippi were recently saved considerable time and expense in reaching six islands from 10 to 15 miles off the Mississippi coast, through the cooperation of the Coast Guard in furnishing a boat for 3 days. One thousand wild citrus trees were found and destroyed.

Terminal inspection of parcel-post shipments extended to State quarantines in four States.--Arrangements for enforcing State quarantines under the act relating to terminal inspection, as revised by the Buck Amendment on June 4, 1936, have recently been made by the States of California, Mississippi, Montana, and Oregon.

Japanese beetle quarantine regulations amended.--Effective May 10, the regulations of Federal Quarantine No. 48 were amended to add certain Maryland and Virginia districts to the area from which the movement of fruits and vegetables of any kind by refrigerator car or motor truck is restricted, and to authorize the Chief of the Bureau to extend or reduce such area by administrative instructions. The amended regulations also specify the conditions under which permits or certificates may be issued to authorize the movement of such products from a regulated area through a nonregulated area to another regulated area.

## INSECTICIDE INVESTIGATIONS

Particle size and toxicity.--This Division has recently acquired a Federal Air Classifier, a device which by means of air currents separates powdered materials into fractions of different average particle size. It has proved capable of dividing considerable quantities of a paris green, such as Chipman's air-floated product, into distinct fractions and Divisions that are interested are invited to consider testing these fractions. Paris green is being used because it is sufficiently granular to furnish a considerable range of particle size and is a definite chemical compound (unlike calcium arsenate), which remains chemically homogeneous during the treatment in the air classifier.

Fluoride residues.--During the past several years the cooperative experiments run by the Division of Insecticide Investigations and the Division of Fruit Insect Investigations at Yakima, Wash., in the removal of cryolite residues from apples have indicated that such removal was difficult; however, it was always recognized that the methods used for the determination of the fluorine were not satisfactory. Last season's fruit was washed and stored until the Division could procure a photometer for use with the colorimetric procedure developed by the Food and Drug Administration. The results for last year have therefore just recently been obtained and the picture appears quite different. The residue from five sprayings with cryolite, containing 0.130 grain F per pound, were reduced below the tolerance of 0.010 by every washing treatment tried, and a residue of 0.180 was similarly reduced by the better treatments. This finding agrees with the work of various other investigators and indicates that the fluoride insecticides merit additional attention from entomologists.

## BEE CULTURE

Cage for controlled mating of queens on the wing.--A cage 20 by 20 by 20 feet made with copper-screening sides and top, has been constructed at the Beltsville, Md., laboratory to test the possibility of having queens mate on the wing within such enclosures. This work is being done following the announcement from a private breeder in California that he has had rather good success in a similar undertaking. A number of years ago an unsuccessful attempt was made by the Bureau along similar lines but using a tent presumably of smaller dimensions. Detailed records of this earlier work are not at hand. The success of such an experiment would greatly speed up breeding work with bees, as controlled mating of bees by artificial insemination still belongs to laboratory technic and is somewhat slow and difficult.

## IDENTIFICATION AND CLASSIFICATION OF INSECTS

New coleopterous larval material received.--In the course of the insect survey of peach orchards, conducted by the Division of Fruit Insect Investigations in an effort to find possible insect vectors of the phony peach disease, certain species of Coleoptera have been reared by W. H. Anderson. Larvae and adults have thus been definitely associated. The larval and pupal skins, together with the adult specimens of *Agonum limbatum* Say, *A. punctiforme* Say, *Nothopus zaibroides* Lec., and *Chauliognathus basalis* L., have been deposited in the National Museum collections. The first three of these species are Carabidae, while the last belongs in the Cantharidae. According to A. G. Boving, this material represents the first correlation of larvae and adults in these cases and makes a valuable addition to the reference collections. From the Division of Foreign Plant Quarantines there have been received, under Hidalgo, Tex., Interception No. 2437, two small curculionid larvae with associated adults. The latter have been determined by L. L. Buchanan as *Anthonomus testaceosquamosus* L. No larvae of this species were previously contained in our collections, nor has this stage been described. Rather severe injury was caused by this weevil to the blossom buds of *Althaea* at Hidalgo. Reared material of the character represented by these two lots is of the greatest value in extending our knowledge of the classification of immature forms.

*Taxonomic studies on elaterid larvae*.--Robert A. Glen, of the Canadian Entomological Branch, has spent approximately 6 months in Washington in close association with A. G. Boving. He is engaged in a taxonomic study of wireworms, particularly the genus *Ludius*, a group which is of considerable economic importance in Canada and the United States. During his stay he was able to investigate, describe, and make figures of all of the species of *Ludius* in our collection and, with the assistance of Dr. Boving, succeeded in obtaining additional material for study from various private entomologists and foreign entomological institutions. This visit was necessary from the standpoint of that project of the Canadian Entomological Branch and it also resulted in definite benefits to our collections. Mr. Glen has sorted and identified our undetermined larval material in the genus *Ludius* and has added to our collections a number of species not previously represented, as well as more than 50 new slides of dissections prepared to show the structural details employed in his descriptions.

*Extension of the known southern range of the pepper weevil*.--Three specimens of *Anthonomus eugenii* Cano, collected on sweet peppers at Chimaltenango, Guatemala, were recently received from J. R. Johnston. There are also two specimens from La Ceiba, Honduras, in the National Museum collection. These localities are apparently the most southern mainland records for this weevil, although the species has previously been reported from Trinidad. It has several times been suggested that *eugenii* Cano is a synonym of *mexicanus* Boh., but L. L. Buchanan reports that a comparison of them, including the male genitalia, shows that they are quite distinct.

*Puerto Rican record for an injurious cerambycid*.--W. S. Fisher has identified as *Xystrocera globosa* Oliv. (family Cerambycidae) a beetle from Santurce, P. R., submitted under San Juan Interception No. 6808. The genus *Xystrocera* is essentially Oriental, whereas the species *globosa* is widely distributed throughout southern Asia, the Malay Archipelago, the Philippine Islands, Egypt, and Africa. In Egypt the larva of *X. globosa* is known as one of the principal enemies of shade trees. This is the first American specimen to be received for determination and evidently represents an introduction. If definitely established, the species may become a serious pest.

Change in a family name in the Diptera.--It was shown in 1932 (Malloch, Bull. 98, Bernice P. Bishop Mus., p. 205) that the well-known dipterous family name Ortalidae needed to be suppressed in favor of the name Otitidae, the typical generic name, Ortalis, being preoccupied in ornithology. Otitidae is still a relatively unfamiliar name to those who are not engaged in taxonomic studies in the Diptera, and so many inquiries have been received from Bureau workers regarding the application of this name that it seems desirable to include this brief statement here.

On parasites associated with the San Jose scale.--P. L. Rice, assistant entomologist of the Delaware Experiment Station, recently submitted for identification a lot comprising several hundred specimens of Chalcidoidea reared by him in the course of a survey of the natural enemies of the San Jose scale, Aspidiotus perniciosus Comst. This material comprised rearings from more than 50 different collections of scale-infested twigs taken in 12 different States, from Delaware and New York to Oregon and California. It was studied by A. B. Gahan and found to comprise 20 different species. Most of these had already been recorded from this host but several records were of species not previously so associated. Of especial interest were specimens of an anomalous trichogrammid, Zaga latipennis Gir., and others apparently belonging to the aphelinine genus Coccophagoides and doubtfully identified as C. kuwanae Silv. Z. latipennis has previously only been known from two specimens reared in 1895 at Charlottesville, Va., from apple twigs infested with San Jose scale. Mr. Rice's specimens of this species were reared from similarly infested apple twigs taken at Parma, Idaho. The record is interesting as tending to confirm the association of the species with San Jose scale, although its exact relationship to the scale is not yet settled. The genus Coccophagoides has not previously been recorded from America. Rice's specimens were reared from infested apple twigs collected at Waltham, Mass. Other species found in the Rice material not before recorded as associated with this scale were the aphelinine Marietta mexicanus How. and two species of Mymaridae, namely, Polynema howardi Gir. and Anagrus nigriventris Gir. The actual parasitization of the scale by the mymarids is perhaps open to some question. The three most abundant parasites reared by Rice were Prospaltella perniciosi Tower, Aphytis diaspidis How., and Aphytis mytilaspidis How.

Records of a Central American leafhopper in the United States.--A single male specimen of Baldulus elimatus (Ball) was found by P. W. Oman in material collected by Wm. F. Turner and associates in El Paso County, Tex., on March 29, 1937. This leafhopper has never been reported in literature from north of Mexico, although this appears to be the second record of its occurrence in the United States. The first record is from a male specimen collected at Patagonia, Ariz., on Sonoita Creek on October 14, 1927, by J. A. Kusche.

Census of insect species and names.--While any figures on the numbers of insect species in existence must be considered estimates only, the following are believed to be approximately correct. They were arrived at after a careful consideration of various factors, and in many cases include actual counts of the species listed in catalogs, and in the Zoological Record for

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the years subsequent to the appearance of those catalogs. Previously published estimates have been confined to the numbers of supposedly valid species described; however, since the taxonomists must deal with all the names that have been employed, whether valid or synonyms and whether species, subspecies or varieties, an attempt has been made to obtain such figures as well. Furthermore, since we have a particular interest in the fauna of North America north of Mexico, separate figures are given for that region. All of the estimates may be considered as extending to the end of the year 1936.

| Insect orders | World fauna | | Nearctic fauna | |
|---|---|---|---|---|
| | Names | Recognized species[1] | Names | Recognized species[1] |
| Anoplura------------ | 280 | 250 | 35 | 30 |
| Coleoptera---------- | 331,200 | 248,800 | 30,700 | 25,600 |
| Collembola---------- | 1,200 | 1,100 | 280 | 250 |
| Corrodentia--------- | 960 | 875 | 110 | 95 |
| Dermaptera---------- | 1,350 | 1,050 | 20 | 15 |
| Diptera------------- | 89,700 | 73,000 | 19,000 | 15,000 |
| Embioptera---------- | 140 | 115 | 4 | 4 |
| Ephemeroptera------- | 1,400 | 1,270 | 580 | 507 |
| Hemiptera----------- | 55,300 | 48,000 | 10,900 | 7,400 |
| Hymenoptera--------- | 118,000 | 102,000 | 19,500 | 16,700 |
| Isoptera------------ | 1,700 | 1,600 | 65 | 59 |
| Lepidoptera--------- | 146,000 | 105,000 | 15,000 | 10,500 |
| Mallophaga---------- | 2,800 | 2,500 | 380 | 300 |
| Mecoptera----------- | 360 | 310 | 75 | 65 |
| Neuroptera---------- | 4,650 | 4,350 | 310 | 275 |
| Odonata------------- | 5,000 | 4,500 | 480 | 400 |
| Orthoptera---------- | 25,000 | 21,000 | 1,900 | 1,150 |
| Plecoptera---------- | 1,500 | 1,260 | 280 | 230 |
| Protura------------- | 60 | 50 | 25 | 20 |
| Siphonaptera-------- | 1,050 | 900 | 300 | 260 |
| Thysanura----------- | 300 | 270 | 40 | 30 |
| Thysanoptera-------- | 2,800 | 2,500 | 500 | 450 |
| Trichoptera--------- | 4,500 | 3,600 | 600 | 500 |
| Total--------- | 795,250 | 624,300 | 101,084 | 79,840 |

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[1] Does not include subspecies and varieties, except in the case of the ants (contained within the Hymenoptera).

It will be noted that the above figures cover only the Insecta. Mites and other arachnids are not included. The only estimates at present available for the Acarina indicate approximately 16,000 recognized world species, with about 1,600 known from North America north of Mexico.

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